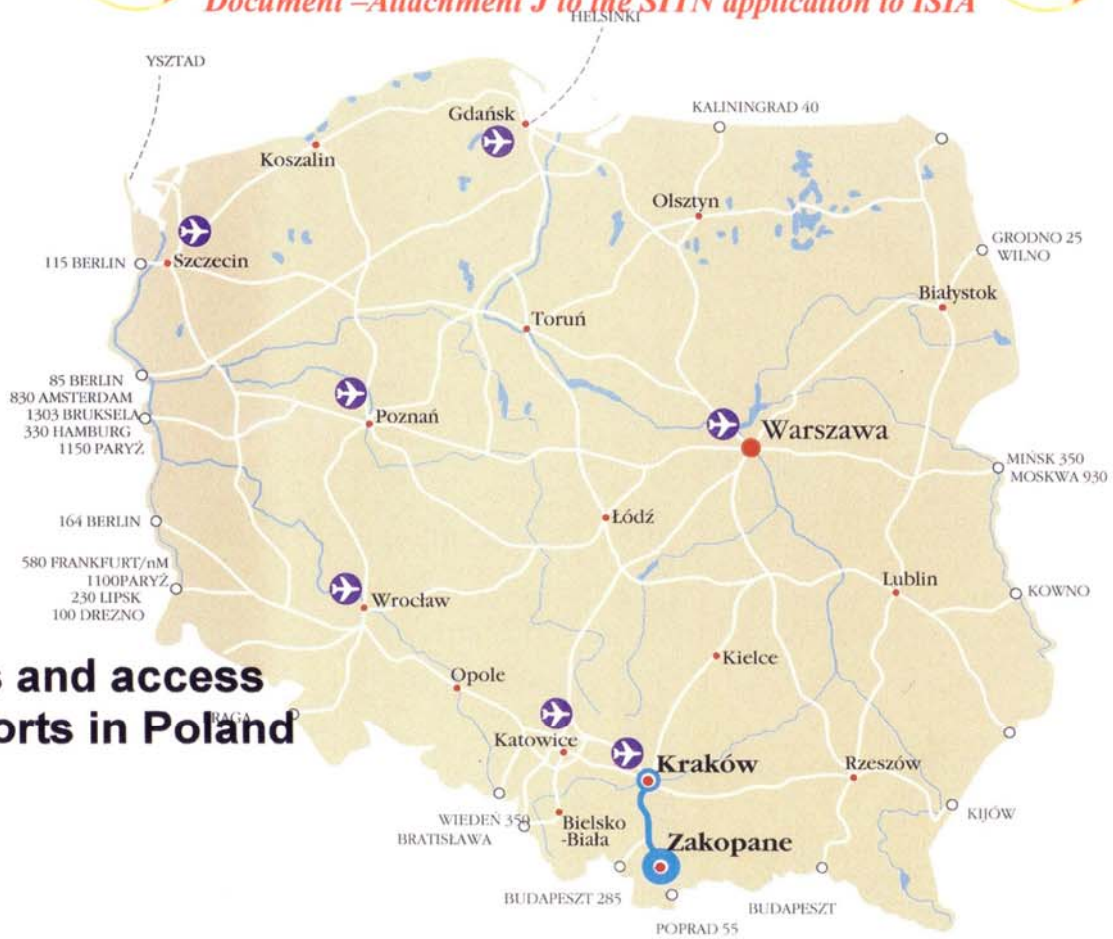
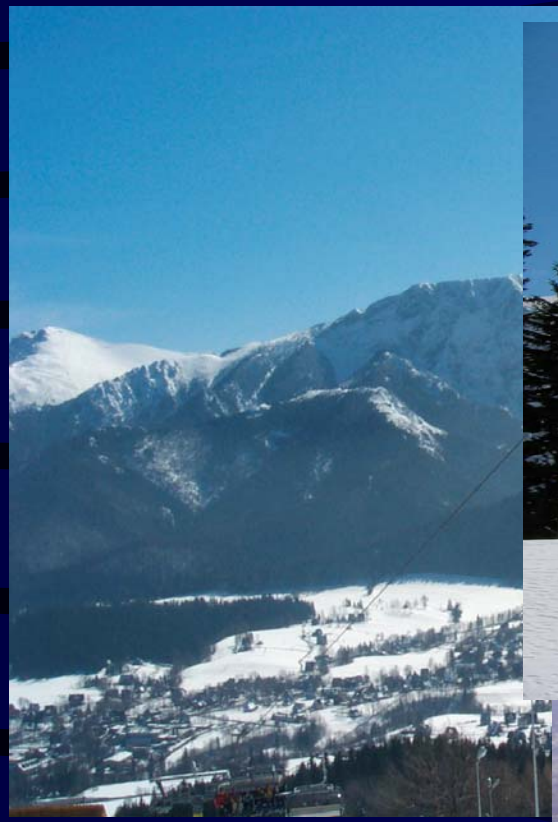
Interski 2007 Korea

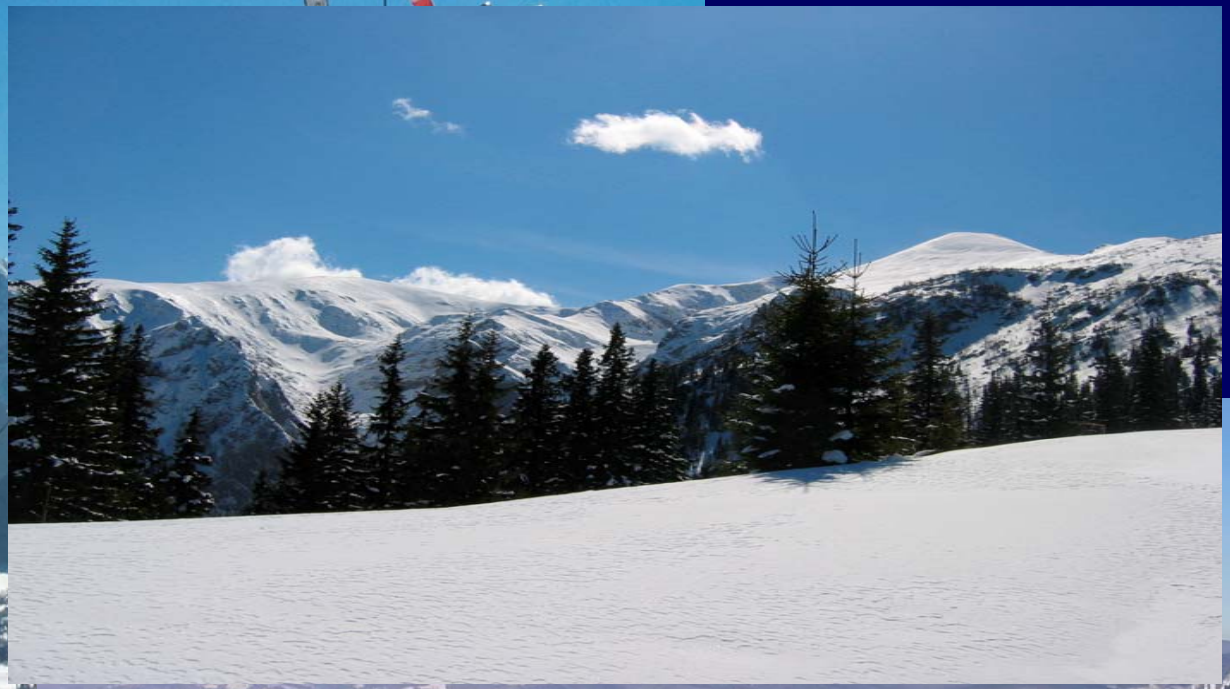
Poland

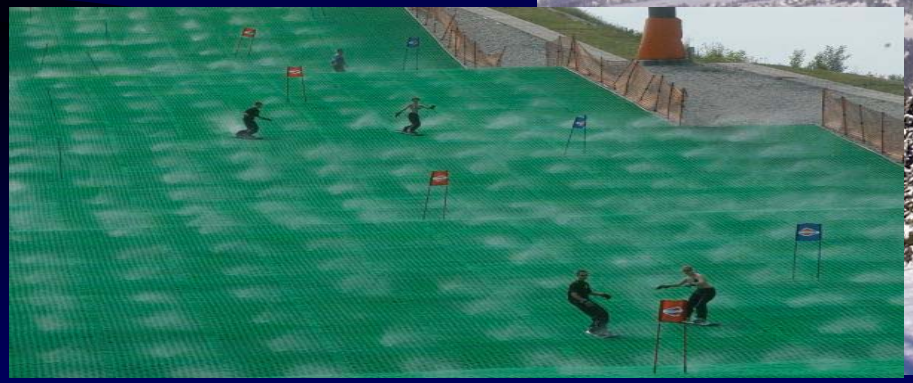
Document –Attachment J to the SITN application to ISIA



Distances and access to ski resorts in Poland







SITN PZN

INSTRUCTORS' ASSOCIATION OF THE POLISH SKI FEDERATION

- SITN PZN today is a non governmental , non profit entity with 4.500 skiinstructors as ordinary members.
- About 1200 members has long term contracts with 87 licensed ski schools i.e. work as professionals.
- SITN grants every year ca 160 new national ski instructors certificates.
- SITN is the only state independent national ski academy in Poland.

Physical Education in Poland

6 Universities of Physical Education (first established in 1930)

10 000 graduates every year with master of physical education degree in:

- **Sports, coaching and training**
- **Physiotheraphy**
- **Tourism and recreation**

Snowsports for All
2007 PyeongChang
INTERSKI Congress
Poland
KIA

PHYSIOLOGICAL BACKGROUND OF MUSCULAR PAIN WHILE SKIING AND DELAYED MUSCLE SORENESS AFTER SKIING

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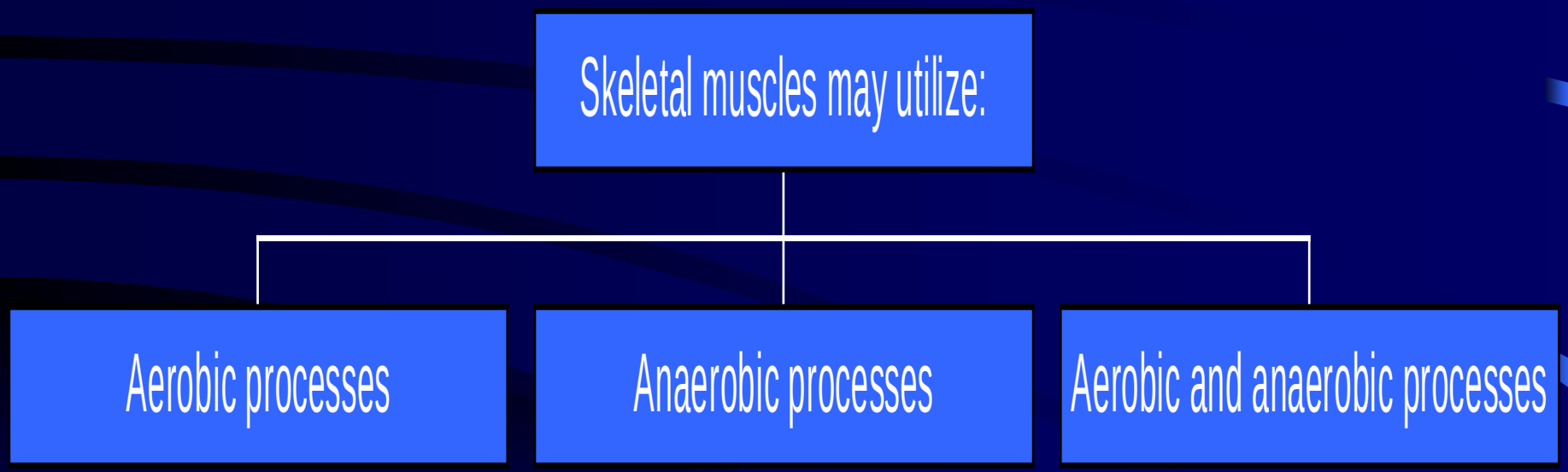
INSTRUCTORS' ASSOCIATION OF THE POLISH SKI FEDERATION

ENERGY PROCESSES IN THE WORKING MUSCLES



The use of aerobic and anaerobic processes depends on the mutual relations between

the capabilities of delivering O_2

to the working muscles and

the current demand for O_2

The capabilities of delivering O_2 to the muscles depends on the efficiency of mechanisms of supplying oxygen:

- Respiratory system
- Circulatory system
- Oxygen capacity of blood (amount of red blood cells, hemoglobin concentration)

The current demand for O_2 depends on:

the intensity of physical effort

(this relationship is proportional – the more intensive effort, the higher demand for oxygen)

When mechanisms of supplying oxygen deliver

- sufficient amount of O_2

the energy comes from aerobic processes

(during long-lasting and low-intensity efforts, for example jogging)

- insufficient amount of O_2

the energy comes from anaerobic processes

(during efforts with maximal intensity, for example sprint)

While skiing the muscles utilize both aerobic and anaerobic processes

- Aerobic

  while making large-radius turns on gentle slopes

(when the intensity of muscle work is low)

- Anaerobic

  while making small-radius turns and skiing down steep slopes

(when the intensity of muscle work is high)

The type of the energy processes determines the kind of metabolites produced in the muscles during exercise

- Aerobic reactions (Krebs cycle)

Carbon dioxide (CO_2)
Water (H_2O)

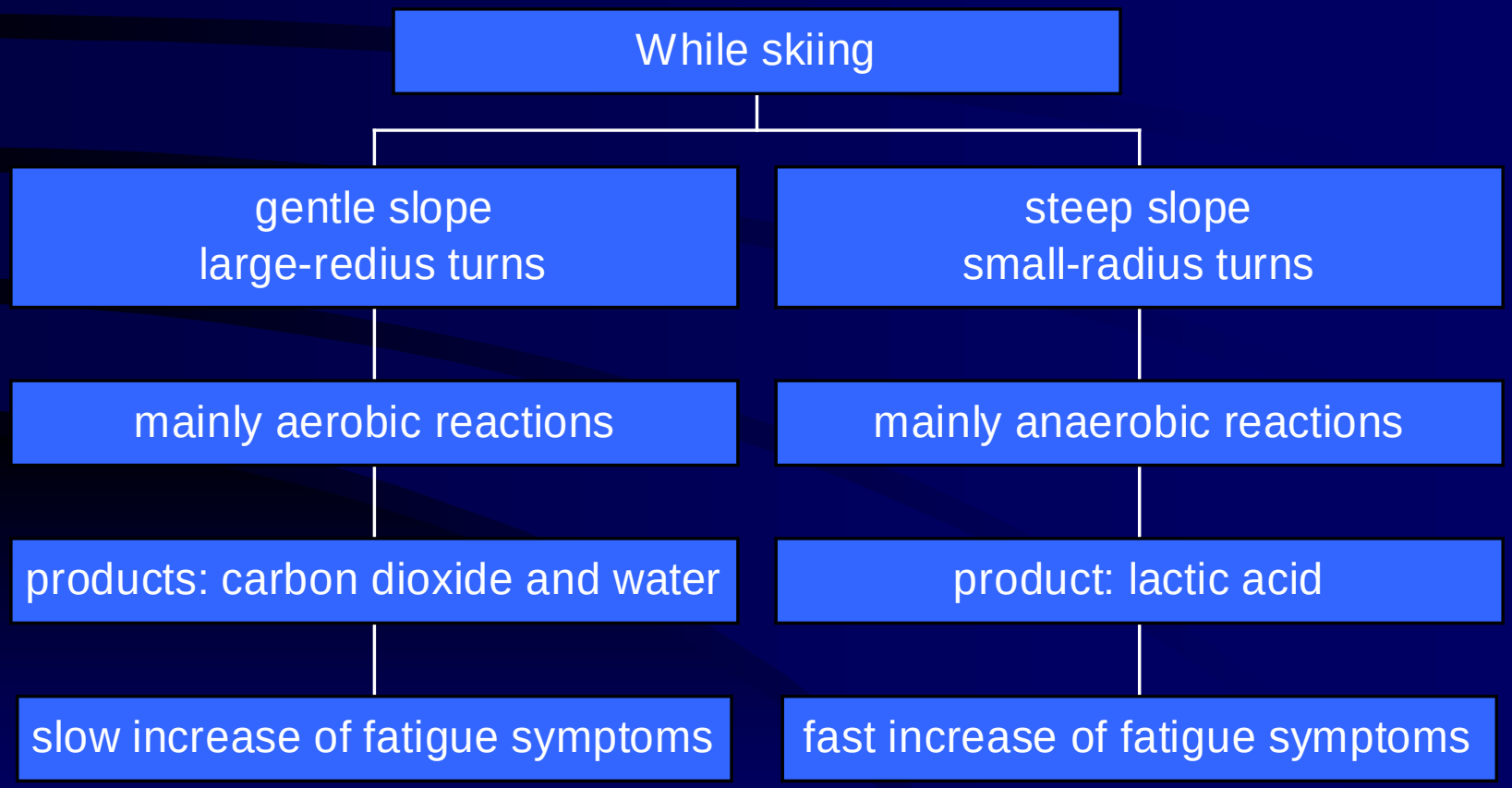
CO_2 – removed from the lungs
H_2O – is used by the body (water deficit)

- Anaerobic reactions (Glycolysis)

Lactic acid (LA)

LA – one of the fundamental causes of fatigue (blocks the sourcing energy from glycolysis)

Conclusion of the physiological background of energy reactions



One can often hear opinions, that the muscular soreness felt during – and sometimes for a few days after – intensive physical effort, is a result of muscle „acidity”

IS IT TRUE ?

IS THE LACTIC ACID, PRODUCED IN ANAEROBIC REACTIONS, A DIRECT CAUSE OF MUSCULAR PAIN ?

Such a statement is false and not confirmed by scientific research:

- Injecting lactic acid directly into the veins or muscles does not cause muscle soreness.
- Increased acidity of the muscles persists much longer than muscle soreness while exercising.
- During the second or third day after physical effort, the concentration of lactic acid is not higher than under resting conditions, but the soreness is still felt.

WHAT, IF NOT LACTIC ACID, IS THEN THE DIRECT CAUSE OF PAIN IN WORKING OR FATIGUED MUSCLES ?

WHAT KIND OF PHYSICAL EFFORT INTENSIFIES THE PAIN ?

WHAT SHOULD BE DONE TO ALLEVIATE THE SYMPTOMS OF MUSCLE SORENESS ?

THE MUSCULAR PAIN WHILE AND AFTER SKIING

- While skiing

Sharp „burning” muscular pain

(occurs during a physical effort and subsides after it stops)

- After skiing

Delayed onset of muscle soreness (DOMS)

(occurs 6 to 12 hours after intensive exercise and usually persists for 2-3 days)

MUSCULAR PAIN DURING SKIING

- Isometric contractions

  (increased tension with no changes in the muscle length).

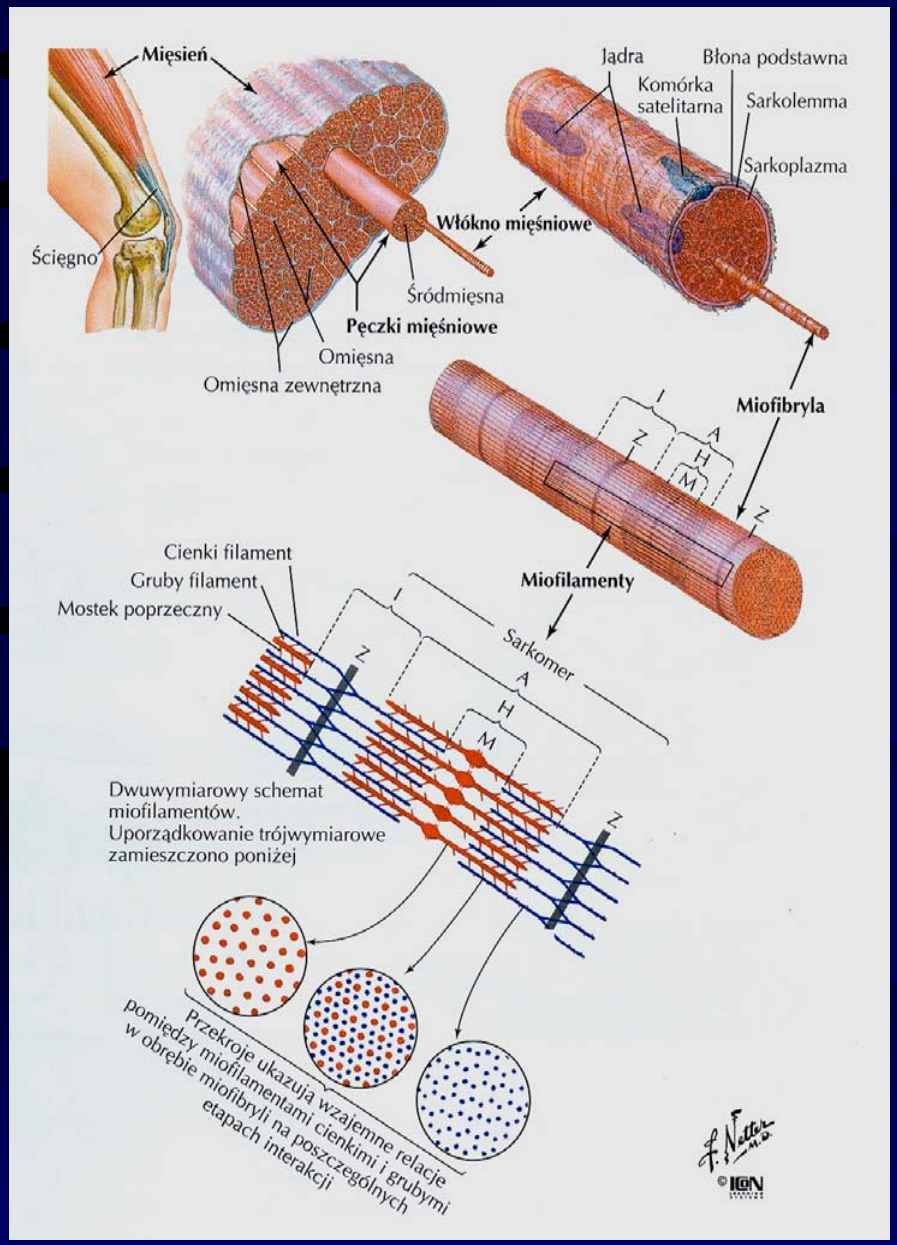
Muscular cells put pressure on the blood vessels causing local ischaemia (inadequate supply of oxygen and increased concentration of the metabolites). This is caused by a very long lasting weighting phase while making turns and the elimination of unweighting, that constantly prevents the muscles from relaxing for a short time.

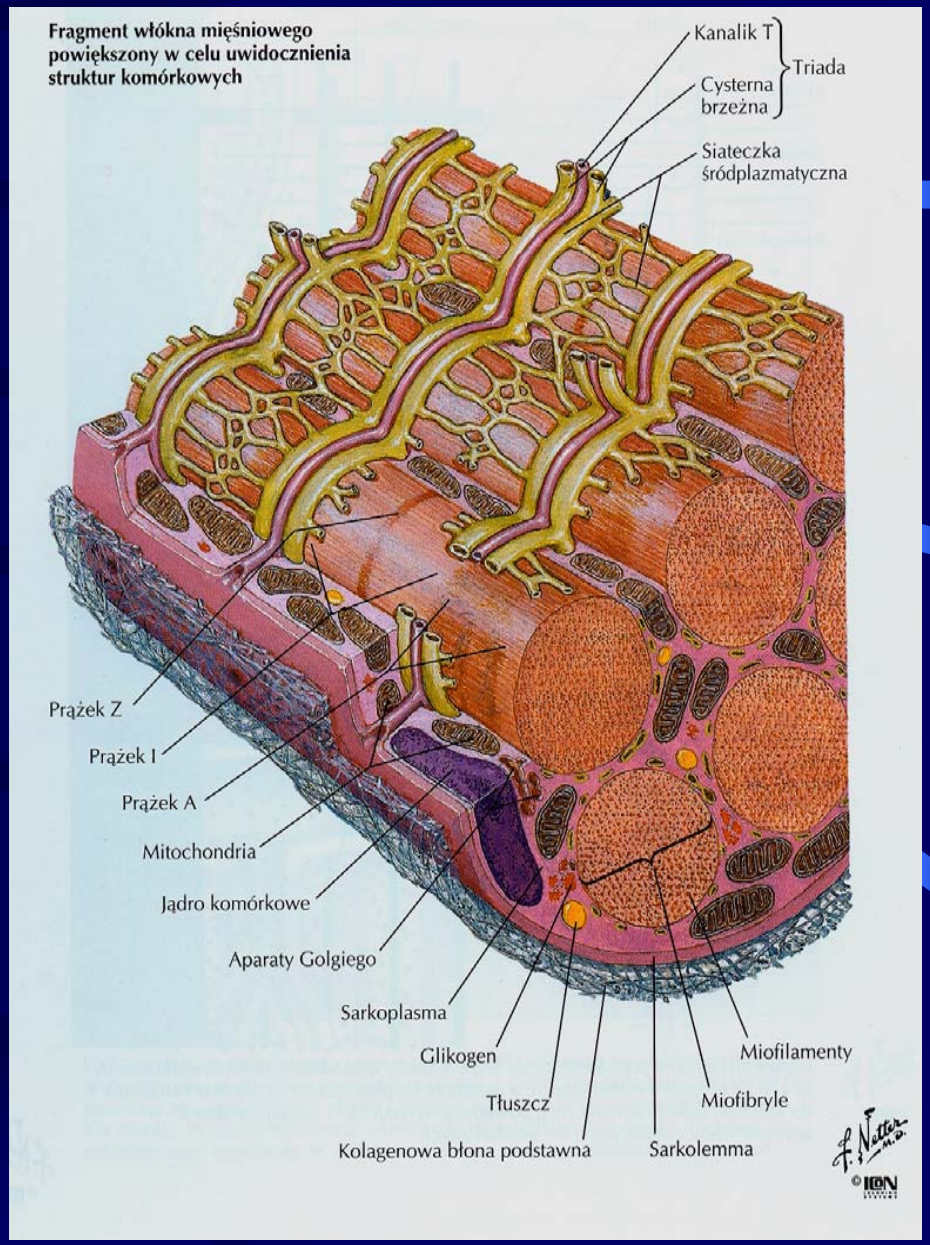
MUSCULAR PAIN WHILE SKIING

- Eccentric contractions
  (increased tension with increased stretch).

While intensive skiing, in the final part of steering phase, when the load is the highest, eccentric work occurs, which is the direct cause of micro-damage within the muscle cells (mainly in quadriceps femoris).
This is because the extensors of the lower leg counteract the centrifugal force, that forces the skier into the snow.

Microstructure of muscle cells





MUSCULAR PAIN AFTER SKIING

- The delayed muscle soreness is the result of the micro-damage within the muscular cells.

The pain is caused by:

- inflammatory processes taking place within the damaged structure of the muscles (cell membrane),
- swelling of the muscular cells,
- influence of the products of muscular damage,
- the healing processes, which are aimed to restore the structure of the myocytes to their predamage condition.

WHAT SHOULD THE SKIER KNOW WHILE PREPARING FOR THE SKI SEASON ?

- Intensive muscle work, involving eccentric contractions, first causes micro-damage in the inner structures of the muscles and is next followed by delayed soreness.

- Because of this micro-damage, both the strength and power of the muscles weaken considerably and then they fully recover after 1-2 weeks.

- For the next 6-12 weeks the muscle cells maintain the increased resistance to reoccurring damage and muscle soreness.

SUMMING UP THE PRESENTED INFORMATION, THE FOLLOWING PROCEDURE CAN BE PROPOSED:

1. Around a week before the first day of skiing in the season, skiers should perform a series of intensive exercises involving eccentric contractions, thus inducting delayed muscular soreness especially in quadriceps femoris,

   for example:

- downhill running,
- running downstairs,
- deep knee bend jumps,
- deep knee bend jumps over an obstacle (e.g. a bench),
- jumping to the ground from a certain height (e.g. from the chair or gym wall bars),
- sit-ups on one or both feet etc.

2. After approximately two days the pain will alleviate.

3. After a week, the power of the muscles will return to its pre-exercise condition.

THIS PROCEDURE SHOULD CONSIDERABLY REDUCE, OR EVEN TOTALLY REMOVE, DELAYED MUSCLE SORENESS ESPECIALLY AFTER THE FIRST SKIING ACTIVITY AT THE BEGINNING OF THE SEASON

Thank you
for your attention

17.20 Polish workshop introduction
Don’t miss ☺